CLAIMS

1. A battery comprising

a cathode and a cathode compartment containing as an oxidant a compound comprising at least one neutral, positive, or negative increased binding energy hydrogen species, and at least one other element;

an anode and an anode compartment containing a reductant; and

a salt bridge completing a circuit between the cathode compartment and the anode compartment.

2. A battery according to claim 1 wherein the increased binding energy hydrogen species comprises an increased binding energy hydride ion.

3. A battery of claim 2 wherein said oxidant comprises a cation M^{n+}, where n is an integer, bound to at least one increased binding energy hydride ion such that the binding energy of the cation $M^{(n-1)+}$ is less than the binding energy of the increased binding energy hydride ion.

4. A battery of claim 2 wherein said oxidant comprises a cation and an increased binding energy hydride ion selected such that the hydride ion is not oxidized by the cation.

5. A battery of claim 2 wherein said oxidant is represented by the formula $M^{n+}H^-\left(\frac{1}{p}\right)_n$ wherein M^{n+} is a cation and n is an integer, and $H^-\left(\frac{1}{p}\right)$ represents an increased binding energy hydride ion where p is an integer greater than 1 and where hydride ion is selected such that its binding energy is greater than the binding energy of the cation $M^{(n-1)+}$.

6. A battery of claim 4 wherein said oxidant comprises a stable cation-hydride ion compound, wherein the reduction potential of the cathode half reaction of the battery is determined by the binding

energies of the cation and the hydride ion of the oxidant.

7. A battery of claim 6 wherein said oxidant is an increased binding energy hydrogen compound comprising an increased binding energy hydrogen molecular ion bound to an increased binding energy hydride ion where the hydride ion is selected such that its binding energy is greater than the binding energy of the reduced increased binding energy hydrogen molecular ion.

8. A battery of claim 7 wherein said oxidant is the compound represented by the formula $H_2^*\left[2c' = \frac{2a_o}{p}\right]^+ H^-(1/p')$, where $H_2^*\left[2c' = \frac{2a_o}{p}\right]^+$ represents a hydrogen molecular ion and $H^-(1/p')$ represents an increased binding energy hydride ion where p is 2 and p' is selected from the group consisting of 13, 14, 15, 16, 17, 18, or 19.

9. A battery of claim 6 wherein said oxidant has the formula $He^{2+}\left(H^-(1/p)\right)_2$, where p is from 11 to 20.

10. A battery of claim 6 wherein said oxidant has the formula $Fe^{4+}\left(H^-(1/p)\right)_4$ where p is from 11 to 20.

11. A battery of claim 2 wherein the increased binding energy hydride ion completes the circuit during the battery operation by migrating from the cathode compartment to the anode compartment through the salt bridge.

12. A battery of claim 2 wherein the salt bridge comprises at least one of an anion conducting membrane or an anion conductor.

13. A battery of claim 12 wherein the salt bridge is formed from a zeolite; a lanthanide boride MB_6, where M is a lanthanide; or an alkaline earth boride $M'B_6$ where M' is an alkaline earth.

14. A battery of claim 2 wherein the cathode compartment contains a

reduced oxidant and the anode compartment contains an oxidized reductant and an ion capable of migrating from the anode compartment to the cathode compartment to complete the circuit whereby said battery is rechargeable.

15. A battery of claim 14 wherein the ion capable of migrating is the increased binding energy hydride ion.

16. A battery of claim 14 wherein the oxidant compound is capable of being generated by the application of a voltage to the battery.

17. A battery of claim 16 wherein the voltage is from about one volt to about 100 volts per cell.

18. A battery of claim 14 wherein the oxidant is represented by the formula $M^{n+} H^-\left(\frac{1}{p}\right)_n$ where $H^-\left(\frac{1}{p}\right)$ is an increased binding energy hydride ion where p is an integer greater than 1 and M^{n+} is a cation selected such that the n-th ionization energy IP_n of formation of the cation M^{n+} from the cation $M^{(n-1)+}$, where n is an integer, is less than the binding energy of the hydride ion.

19. A battery of claim 14 wherein the reduced oxidant is iron metal, and the oxidized reductant comprising the increased binding energy hydride ion is potassium hydride ($K^+H^-(1/p)$), where $H^-\left(\frac{1}{p}\right)$ represents said hydride ion where p is an integer greater than 1.

20. A battery of claim 16 wherein the reduced oxidant is (Fe) which goes to the oxidation state (Fe^{4+}) to form the oxidant $(Fe^{4+}\left(H^-(n=1/p)\right)_4)$ where $H^-\left(\frac{1}{p}\right)$ is an increased binding energy hydride ion where p is an integer from 11 to 20, the oxidized reductant is (K^+) which goes to the oxidation state (K) to form the reductant potassium metal, and the hydride ion completes the circuit by migrating from the anode compartment to the cathode compartment through the salt bridge upon

application of a proper voltage.

21. A battery of claim 2 wherein the cathode compartment functions as the cathode.

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22. A high voltage electrolytic cell for preparing increased binding energy hydrogen compounds, said cell comprising

a vessel containing

a cathode,

an anode,

an electrolyte having an increased binding energy hydride ion as an anion, and

an electrolytic solution containing the electrolyte and in contact with the cathode and the anode.

23. A cell of claim 22 wherein the increased binding energy hydrogen compounds produced by the cell are Zintl phase silicides or silanes, and said compounds are prepared without the decomposition of the anion, the electrolyte, or the electrolytic solution.

24. A cell of claim 22 being capable of operating at a desired voltage without decomposition of the increased binding energy hydride ion.

25. A cell of claim 22 wherein the increased binding energy hydrogen compounds produced comprise a cation M^{n+}, where n is an integer, and wherein the increased binding energy hydride ion $H^{-}\left(\frac{1}{p}\right)$, where p is an integer greater than 1, is selected such that its binding energy is greater than the binding energy of the cation $M^{(n-1)+}$.

26. A cell of claim 22 wherein the increased binding energy hydrogen compounds produced comprise a cation formed at a selected voltage such that the n-th ionization energy IP_n of the formation of the cation M^{n+} from $M^{(n-1)+}$, where n is an integer, is less than the binding energy of the increased binding energy hydride ion $H^{-}\left(\frac{1}{p}\right)$, where p is an integer

greater than 1.

27. A cell of claim 22 wherein the increased binding energy hydrogen compounds produced comprise an increased binding energy hydride ion which is selected for a desired cation such that the hydride ion is not oxidized by the cation.

28. A cell of claim 27 wherein the cation is either of He^{2+} or Fe^{4+}, and the increased binding energy hydride ion is $H^{-}\left(\frac{1}{p}\right)$ where p is from 11 to 20.

29. A fuel cell comprising

a source of oxidant, said oxidant comprising increased binding energy hydrogen atoms,

a cathode contained in a cathode compartment in communication with the source of oxidant,

an anode in an anode compartment, and

a salt bridge completing a circuit between the cathode and anode compartments.

30. A cell of claim 29 wherein the increased binding energy hydrogen atoms react to form increased binding energy hydride ions as a cathode half reaction.

31. A cell of claim 29 wherein the source of oxidant is an increased binding energy hydrogen compound containing at least one neutral, positive, or negative increased binding energy hydrogen species and at least one other element.

32. A cell of claim 31 wherein the increased binding energy hydrogen atoms are supplied to the cathode from the oxidant source by thermally or chemically decomposing the increased binding energy hydrogen compounds.

33. A cell of claim 29 wherein the source of oxidant is selected from a

group consisting of an electrolytic cell, a gas cell, a gas discharge cell, and a plasma torch cell.

34. A cell of claim 31 wherein the increased binding energy hydrogen compounds comprise a cation M^{n+}, where n is an integer, bound to an increased binding energy hydride ion such that the binding energy of the cation $M^{(n-1)+}$ is less than the binding energy of the increased binding energy hydride ion.

35. A cell of claim 34 wherein the source of oxidant is an increased binding energy hydrogen compound represented by the formula $M^{n+}H^{-}\left(\frac{1}{p}\right)_{n}$ wherein M^{n+} is a cation, n is an integer, and $H^{-}\left(\frac{1}{p}\right)$ represents an increased binding energy hydride ion where p is an integer greater than 1 and where the hydride ion is selected such that its binding energy is greater than the binding energy of the cation $M^{(n-1)+}$.

36. A cell of claim 29 wherein the cathode compartment is the cathode.

37. A cell of claim 29 further comprising a fuel comprising increased binding energy hydrogen compounds.